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(54) **Vehicle door lock system.**

(57) A vehicle door lock system comprises a latch mechanism 10 connected to a door handle 12 by a single push/pull control cable 14. The control cable has three operating positions; an intermediate unlocked position (2); push to lock (position 3); and pull to release (position 1).

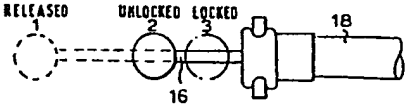

FIG. 1.

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VEHICLE DOOR LOCK SYSTEM

This invention relates to a vehicle door lock system and in particular to means for interconnecting a latch mechanism on a vehicle door with inner and/or outer door handles.

Rod connectors used at present do not readily accommodate manufacturing tolerances. Different sized rods have to be used for connecting similar latches and handles in doors of different sizes.

According to the present invention, there is provided a vehicle door lock system comprising a latch mechanism mounted on a vehicle and having a release lever operable to release the latch mechanism and a locking lever having a locked position in which release of the latch mechanism is prevented and an unlocked position in which release of the latch mechanism is enabled; and handle means mounted on the door remote from the latch mechanism and manually operable for releasing, locking and unlocking the latch mechanism; the system being characterised in that the handle means is connected to the latch mechanism by a single push/pull control cable.

In the following specification and the appended claims the components of the Bowden control cable are identified by the terms "outer sheath" and "inner cable". In each embodiment and in each of the claims these components may be substituted one for the other and the claims are to be contrued accordingly.

The invention will now be described further, by way o example, with reference to the accompanying drawings, in which:

Figure 1 is a diagram of the input end of a control cable for a vehicle door lock system embodying the

invention showing the relative positions of th inner cable and sheath common to all mbodiments of the invention;

Figures 2A and 2B are front and plan views, respectively, of an inner door handle for a vehicle door lock system embodying the invention;

Figures 3A and 3B are rear and end views, respectively, of a latch mechanism in a vehicle door lock system embodying the invention illustrated in its unlocked condition;

Figures 3C and 3D show the latch mechanism of Figures 3A and 3B in its locked and released conditions, respectively;

Figure 4 is an end view showing a modification of the latch mechanism of Figures 3A to 3D;

Figures 5A and 5B are plan and front views, respectively, of a first alternative inner door handle;

Figures 6A to 6D are views corresponding to Figures 3A to 3D of an alternative latch mechanism; and

Figures 7A and 7B are plan and front views, respectively, of a second alternative inner door handle.

A vehicle lock system embodying the invention comprises a latch mechanism 10 (Figures 3A and 3B) and an inner door handle 12 (Figures 2A and 2B) mounted on a vehicle door (not shown) and interconnected only by a single push/pull Bowden control cable 14.

The inner cable 16 and outer sheath 18 have three relative operating positions illustrated in Figure 1 at the input end of the control cable 14, namely : an unlocked position 2; a locked position 3 reached by pushing the inner cable 16 relative to the outer sheath 18 from position 2; and a released position 1 reached by pulling the inner cable 16 relative to the outer sheath 18 from position 2.

Referring to Figures 3A to 3D, the latch mechanism 10 is basically of the conventional form used on the Ford Escort Mk III and comprises a housing 20, and a bifurcated keeper member (not shown) pivotally mounted on a shaft 22 to which is fixed ratchet member 24. A pawl 30 mounted on pivot 25 fixed to the housing 20 is biased by spring 28 into engagement with ratchet member 24. The pawl 30 cooperates with teeth 32, 34 on the ratchet member to establish partially and fully latched portions, the fully latched position being shown in Figure 3A. A release lever 26 has an aperture 27 receiving a pin 29 fixed to the pawl 30. The release lever 26 is movable in a clockwise direction about a pivot pin 36 to disengage the pawl 30 and release the latch. Such clockwise movement may be effected either by the inner door handle 12 acting through control cable 14 or by an outer door handle acting through a rod (not shown) connected to slot 38.

A locking lever 40 mounted on pivot 42 has a downward extending arm 46 to which is fixed pivot pin 36. An L-shaped slot 44 in the release lever 26 receives the pivot pin 36. A toggle spring 48 urges the locking lever either to one end or the other of the horizontal portion of the slot 44 thereby defining an unlocked position (Fiure 3A) in which the release lever can be pivoted about pin 36 to disengage the pawl 30 from the ratchet member 24 and a locked position (Figure 3C) in which operation of the outside handle causesthe pin 36 to move

along the vertical portion of the slot 44 without disengaging the pawl from the ratchet member.

The locking lever 40 is connected and at end 50 by a rod (not shown) to a key cylinder associated with the outside doorhandle and at its other end to the control cable 14.

The outer sheath 18 is fixed to the latch housing 20. The inner cable 16 extends through first and second parallel flanges 52, 54 on the locking lever 40. An end fitting 56 fixed to the inner cable 16 has a transversely disposed disc 58 at one end providing a lost motion connection of the inner cable 16 to the locking lever 40. A coil spring 60 acts between the disc 58 and the first flange 52 to biass the inner cable in its push direction relative to the locking lever 40.

The other end 62 of the end fitting 56 forms a one way connection to the release lever 40.

Figure 3A shows the latch in the unlocked position corresponding to control cable input position 2 illustrated in Figure 1. In operation, pushing the input end of the control cable to position 3 causes the disc 58 at the output end of the control cable 14 to displace the locking lever from its unlocked position to its locked position illustrated in Figure 3C. As shown in Figure 3C, the end fitting 56 is free to pass through its aperture in the release lever 26.

Pulling the input end of the control cable back from position 3 to position 2 returns the locking lever to the unlocked position because coil spring 60 is strong enough to overcome the toggle spring 48.

Pulling the input end of the control cable further from position 2 to position 1 effects release of the latch by engagement of end fitting 56 with the release lever 26 as shown in Figure 3D. Coil spring 60 is compressed as the inner cable effects its lost motion relative to the locking lever 40.

Return of the inner cable to position 2 is effected by coil spring 60 and spring 28 acting at the output end of the control cable.

Referring to Figure 4, a child proof latch may be provided by a toggle lever 114 pivotably mounted on the locking lever 40. A finger 116 engages the cable end fitting 58 to prevent release movement when the child proof latch is "on" (full lines in Figure 4). The lever 114 is accessible for operation only when the vehicle door is open.

Figures 2A and 2B show an inner door handle 10 comprising a housing 64 fixed to the door, and a release handle 66 and toggle locking button 68 pivotably mounted on the housing by a common pivot pin 70.

The outer sheath 18 is connected to the housing 20 by a screw-threaded adjuster 86 and an end-fitting 72 on the inner cable 16 is slidable in an arcuate slot 74 in the handle 66 providing a lost motion connection.

A coil spring 76 is mounted on the pivot pin 70. One end 78 of the coil spring 76 engages a first stop 80 on the toggle button 68 and the other end 82 is fixed to the end fitting 72. A second stop 84 on the toggle button 68 engages the end 82 of the coil spring 76 and holds it in a wound up condition.

The unlocked position 2 of the inner door handle is as shown in full lines in Figure 2B.

In operation, clockwise movement of the toggle button rotates the coil spring 76 and moves the inner cable 16 from position 1 to position 2 causing locking of the latch mechanism.

Anti-clockwise movement of the toggle button from its locked position (shown in dotted lines in Figure 2B) rotates spring 76 back to position 2.

When the release handle 66 is pulled with the toggle button in the unlocked position after an initial lost motion, the inner cable is pulled from position 2 to position 3 to release the latch mechanism. This movement also disengages end 82 of the coil spring from the toggle button and winds up the coil spring 76 without moving the toggle button 68.

When the release handle 66 is pulled with the toggle button in the locked position, the initial movement of the handle rotates the toggle button 68 back to its unlocked position.

Figures 5A and 5B show an alternative inner door handle in which the outer sheath 8 is mounted on a slider 88 instead of being fixed to the handle housing. Rotation of the toggle button 90 displaces the slider 88. There is no lost motion between the release handle 92 and the inner cable 16. In Figure 5A the locked position of the door handle is shown in full lines. In operation, clockwise movement of the toggle button 90 from the locked to the unlocked positions pulls the outer sheath relative to the inner cable from position 3 to position 2. Anti-clockwise movement of the toggle button pushes the control cable input end from relative position 2 to relative position 3.

When the release handle 92 is pulled, the initial movement pulls the inner cable to position 2 but leaves the toggle button in its locked position. Further movement of the release handle pulls the cable to position 1 to release the latch. As soon as the handle is let go, its initial return movement displaces the toggle button to the unlocked position.

A further alternative inner door handle 10 is shown in Figures 7A and 7B. In this mechanically simpler version there is no locking button. Instead, handle 94 is pulled to release the latch (dotted line position) and pushed to lock (chain dotted line position). Spring means 96 bias the handle 94 to its unlocked position (full lines). The handle 94 is connected to the inner cable 16 and the outer sheath 18 is connected to the handle housing 18.

In order to assist in identification of the positions of the handle, an orange portion 100 is exposed if the handle is in its unlocked position and a green portion 104 is exposed if the handle is in its locked position.

Figures 6A to 6D show an alternative construction of the connection of the output end of the control cable 14 to the latch mechanism 10. The latch mechanism itself is basically the same as that shown in Figures 3A to 3D. Parts common to both embodiments retain the same reference numerals, modified parts have the same reference numeral with a prime, and new parts have new numerals.

The release lever 26' is formed with revised L-shaped slot 106 arranged such that clockwise (instead of anti-clockwise) displacement is required to move the locking lever 40' from its unlocked position (Figure 6A) to its locked position (Figure 6C).

The outer sheath 18 is fixed to a mounting flange 108 on the locking lever 40'. An end fitting 110 on the inner cable 16 engages a stop 112 fixed to the housing 20'.

In operation, push movement of the inner cable 16 relative to the outer sheath 18 (caused by moving the input end of the cable 14 from position 2 to position 3) produces upward movement of the output end of the outer sheath because the inner cable 16 reacts against the stop 112. The outer sheath moves the locking lever 40' to its locked position (Figure 3C) full movement of the inner cable 16 relative to the outer sheath 18 (input position from 3 to 2) returns the locking lever 40' to the unlocked position because spring 28 is stronger than toggle spring 48.

Further pull movement (input position 2 to 1) causes the inner cable to displace release lever 26' in the clockwise direction to release the latch (Figure 6D).

CLAIMS

1. A vehicle door lock system comprising:

a) a latch mechanism (10) mounted on a vehicle and having a release lever (26) operable to release the latch mechanism (10) and a locking lever (40) having a lock position in which release of the latch mechanism (10) is prevented and an unlock position in which release of the latch mechanism (10) is enabled; and

b) handle means (12) mounted on the door remote from the latch mechanism (10) and manually operable for releasing, locking and unlocking the latch mechanism (10);

characterised in that the handle means (12) is connected to the latch mechanism by a single push/pull control cable (14).

2. A door lock system as claimed in Claim 1, characterised in that the handle means is operable to pull the inner cable relative to its sheath from an unlock position to a release position or to push the inner cable relative to its sheath from the unlock position to a lock position.

3. A door lock system as claimed in Claim 2 characterised in that:

a) the sheath of the control cable is fixed to the housing of the latch mechanism;

b) the inner cable has a lost motion connection to the locking lever biased by spring means acting on the inner cable in its push direction whereby the inner cable pushes the locking lever to its locking position when the inner cable is pushed to its lock position, the

spring means mov s the locking lever to its unlock position when the inner cable is pulled back to its unlock position, and movement of the inner cable in the pull direction from the unlock position compresses the spring means without movement of the locking lever; and

c) a one-way connection of the inner cable to the release lever allows push movement of the inner cable from its unlock position to its lock position to take place without displacement of the release lever but enables pull movement of the inner cable from its unlock position to its release position to displace the release lever to its latch releasing position.

4. A door lock system as claimed in Claim 3, characterised by a blocking lever mounted on the locking lever and movable towards and away from a blocking position in which it prevents movement of the inner cable relative to the release lever and thereby prevents pull movement of the inner cable from its unlock position to provide child proof locking of the handle means.

5. A door lock system as claimed in Claim 2, characterised in that:

a) the outer sheath of the control cable is connected to the locking lever;

b) the inner cable is connected to the release lever;

c) pull movement of inner cable from its lock position initially causes the sheath to move the locking lever to its unlock position and further pull movement causes displacement of the release lever by the inner cable; and

d) push movement of the inner cable from its unlock position is blocked by engagement of the inner cable, directly or indirectly, with the latch housing so that the sheath moves the locking lever to its unlock position.

6. A door lock is claimed in any of Claims 2 to 5, in which the handle means is mounted on the inside of the door and is characterised by a release handle operable to pull the inner cable and a locking button connected to the sheath, movement of the locking button with the release handle in its rest position causing movement of the sheath between lock and unlock positions relative to the cable, operation of the release handle with a locking button in its lock position being effective initially to displace the locking button to its unlock position, further movement being effective to pull the cable to its unlock position relative to the sheath.

7. A door lock as claimed in any of Claims 2 to 5, in which the handle means comprises a release handle and a locking button mounted on the inside of the door, characterised in that the sheath is fixed to a housing of the handle means, the release lever is connected with lost motion to the inner cable and the locking button is connected by spring means to the inner cable so that movement of the locking button effects movement of the cable between lock and unlock positions at opposite extremes of the lost motion relative to the release handle and operation of the release handle with the locking button in the lock position causes displacement of the locking button by its spring means to the unlocked position followed by winding up of the spring means without further movement of the locking button.

8. A door lock as claimed in any of Claims 2 to 5, in which the handle means is a release handle mounted on the inside of the door, characterised in that the

release handle is connected to the inner cable and displacement f the release handle in one direction moves the cable to its release positon and in the opposite direction moves the control cable to its lock position.

FIG.1.

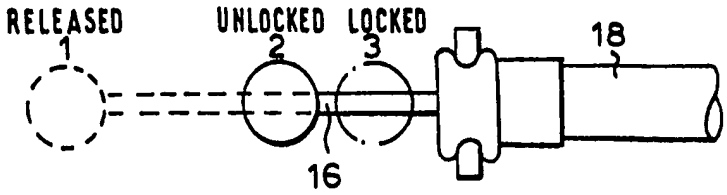


FIG. 1.

FIG. 2 A.

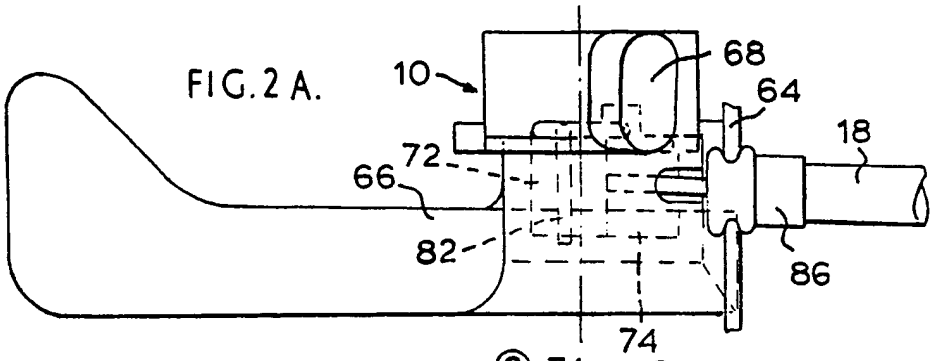


FIG. 2 B

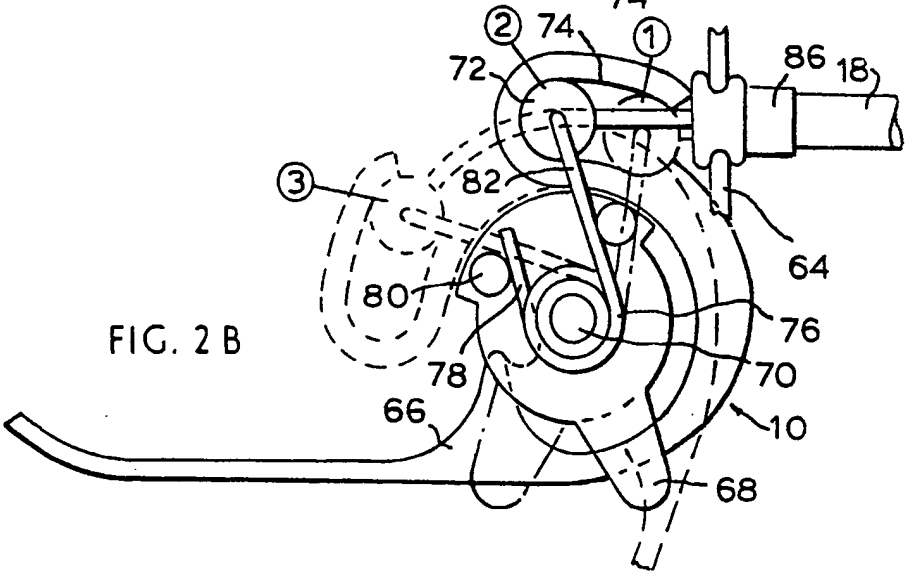


FIG. 3A

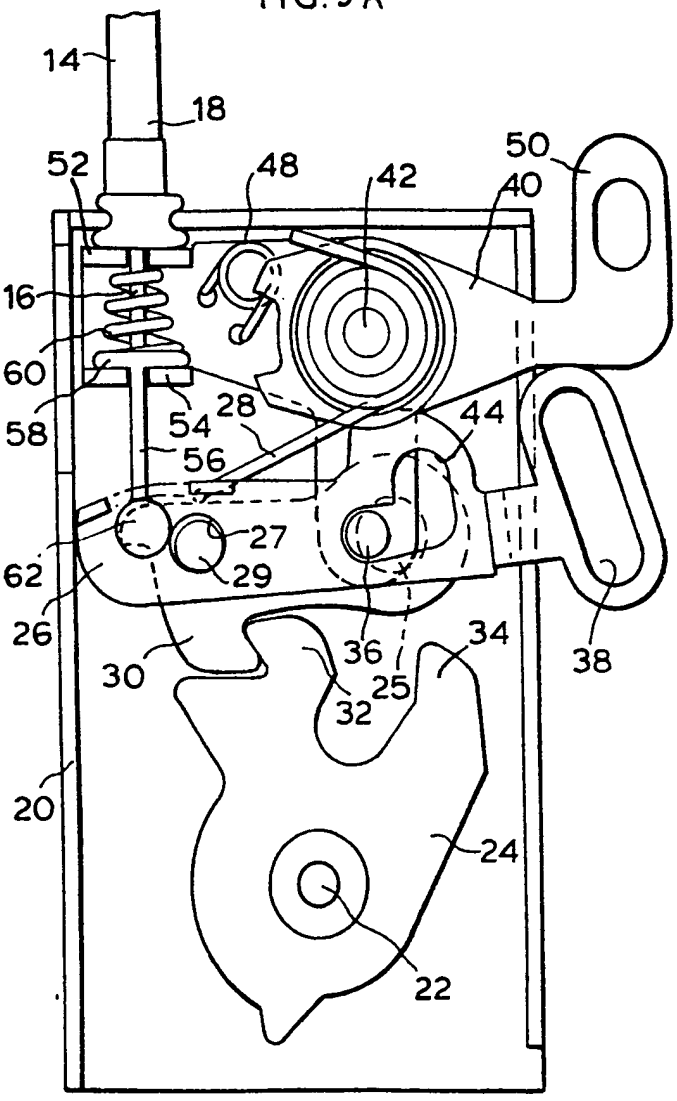
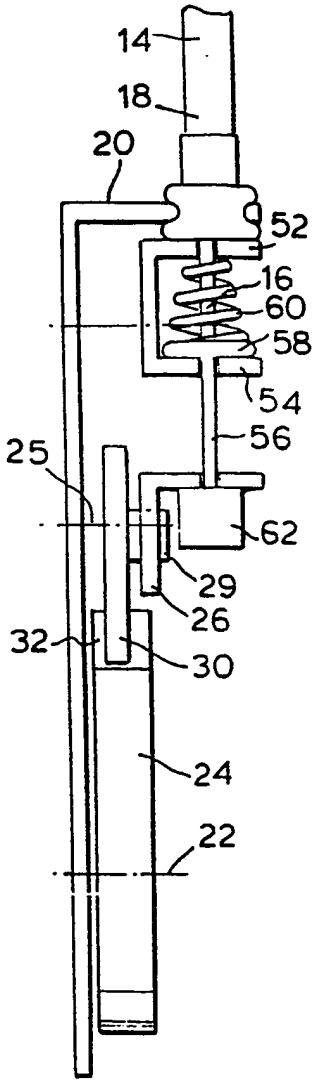

14
18
52
48
42
50
40
16
60
58
54
28
44
56
27
29
62
26
30
36
34
25
32
38
20
24
22

FIG. 3B


14
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20
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16
60
58
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56
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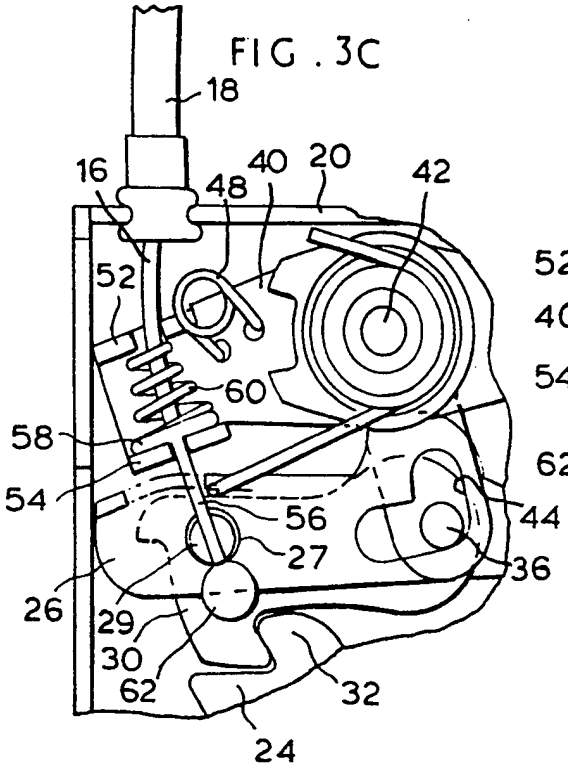
62
29
26
32
30
24
22

FIG. 3C



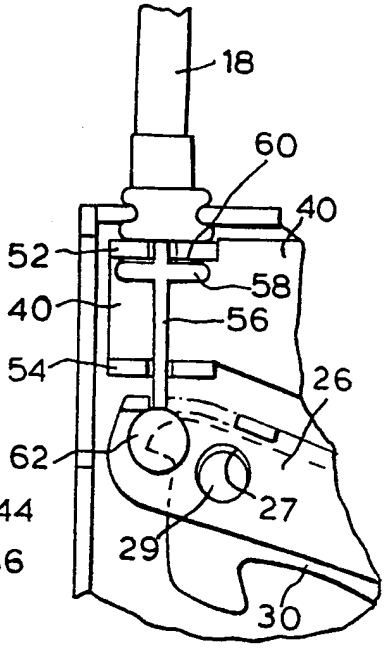


FIG. 3D.

FIG. 4.

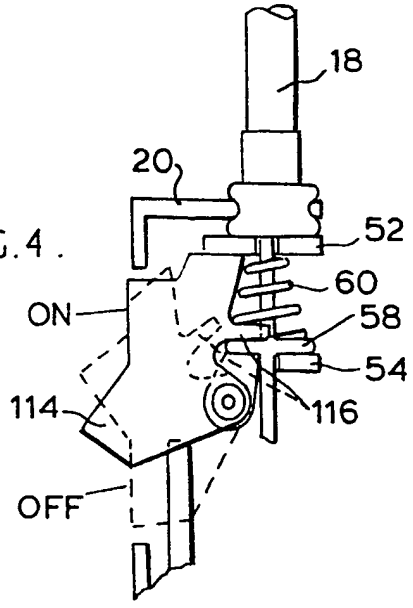


FIG.5A

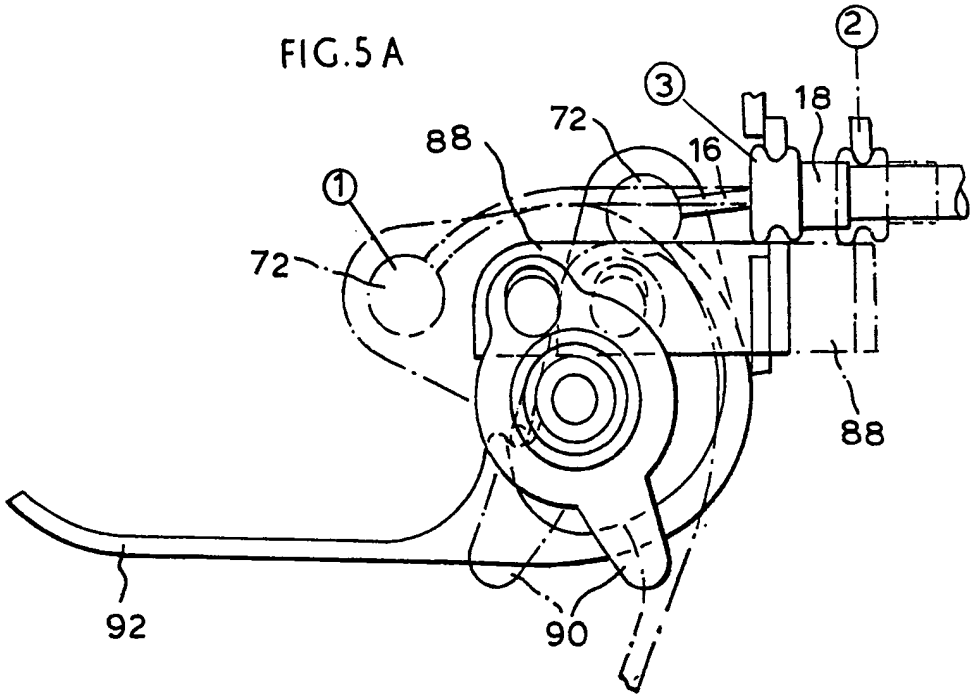


FIG.5B

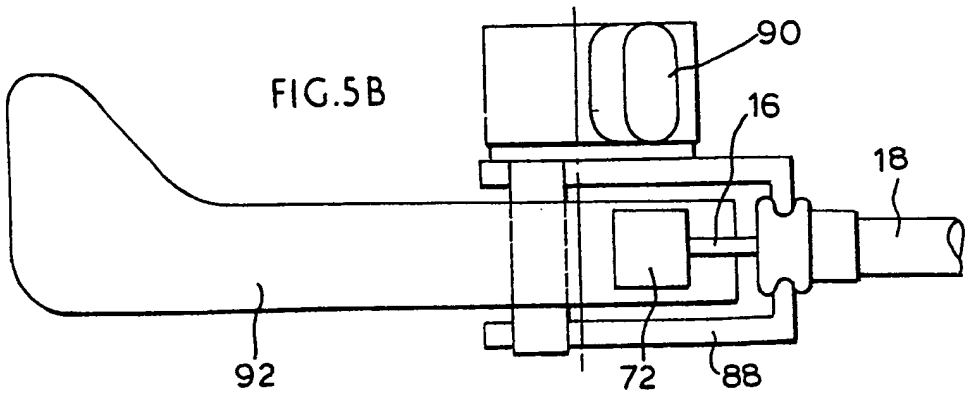


FIG.6A.

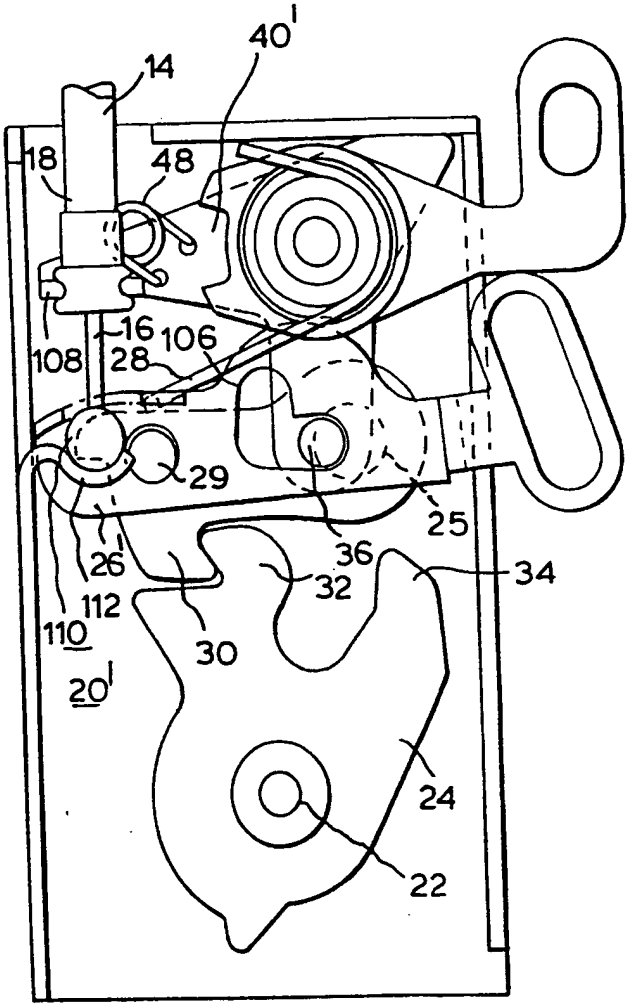
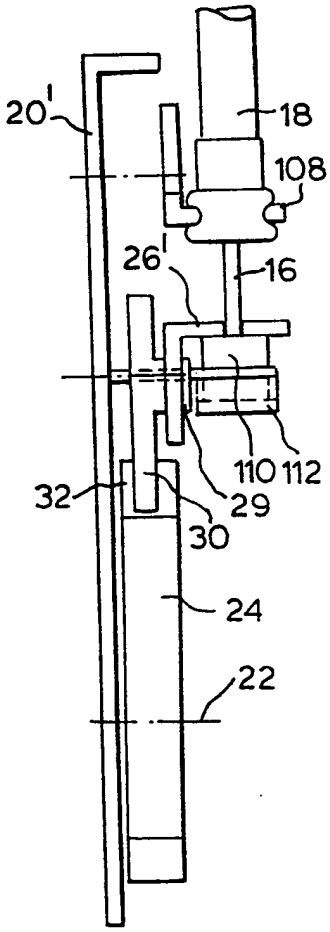

40'
14
18
48
108
16
106
28
29
25
26'
36
32
34
112
110
30
20'
24
22

FIG.6B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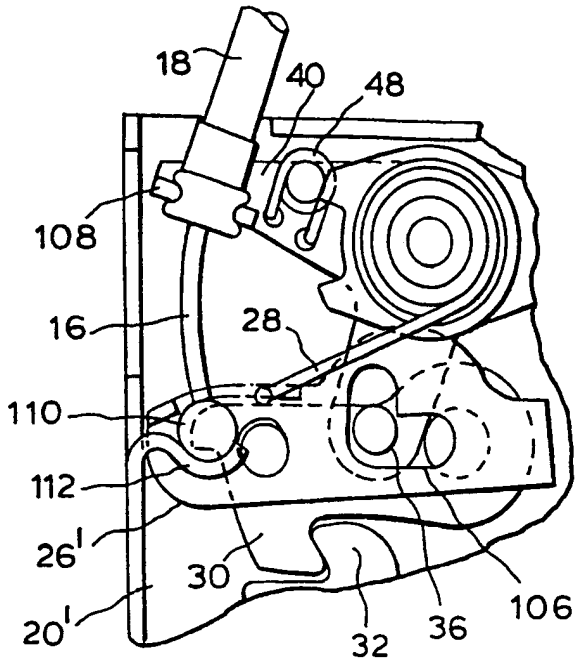
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106

FIG. 6C.

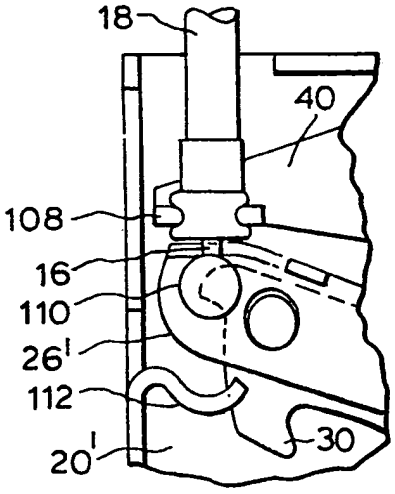
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FIG. 6D.

FIG. 7B.

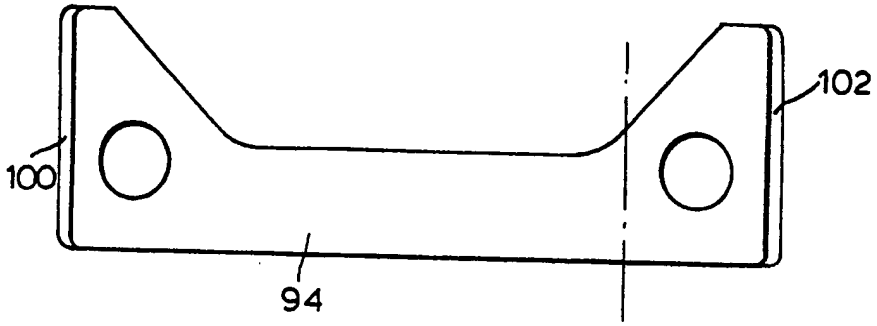

FIG. 7A.